

THE SILURIAN TRILOBITES OF NEW SOUTH WALES,
WITH REFERENCES TO THOSE OF OTHER
PARTS OF AUSTRALIA.

BY R. ETHERIDGE, JUNR., CURATOR OF THE AUSTRALIAN MUSEUM
—AND JOHN MITCHELL, PUBLIC SCHOOL, NARELLAN.

PART IV.

The ODONTOPLEURIDÆ.

(Plates L.-LV.)

The next family we propose to take up is that of the Odontopleuridæ, adopting this name in preference to Acidaspidæ, because we have every reason to believe it to have precedence. Burmeister used the term in 1843, but we have not been able to ascertain at how early a date Barrande employed that of Acidaspidæ, with which Zittel credits him. It could, however, hardly have been before the date in question. The genera, or sections of the old genus, *Acidaspis*, whichever the idiosyncrasy of the reader may choose to regard them, are the following :—

Ceratocephala, Warder, 1838.

Odontopleura, Emmrich, 1839.

Acidaspis, Murchison, 1839.

Dicranurus, Conrad, 1841.

Selenopeltis, Corda, 1847.

Ancyropyge, Clarke, 1891.

Of these we have been able to recognise in Australia only two, viz. :—

Odontopleura, Emmrich.

Ceratocephala, Warder.

but possibly a third (*Selenopeltis*, Corda) may be represented by our *Ceratocephala longispina*.

None were described by Prof. L. G. de Koninck in his work on the "Palæozoic Fossils of N.S. Wales."

The study of this group has proved an arduous one from the complex nature of the cephalic shield or cephalon, and we may have erred by introducing too much detail; this is, however, an error on the right side.

“Of all the extravagant forms of this curious family of Trilobites,” says Salter,* “none seem so extravagant in its ornament as the genus *Acidaspis*; the head, thorax, and tail being literally crowded with spines wherever an available angle occurs.”

Genus *ODONTOPLEURA*, Emmrich, 1839.

Odontopleura, Emmrich, De Trilobitis, 1839, p. 35.

„ Burmeister, Organization of Trilobites (Ray Soc.),
1846, p. 61.

„ Clarke, 10th Ann. Report State Geol. N. York for
1890 (1891), p. 67.

Obs.—This genus is distinguished from other Acidaspids by having the occipital ring either with or without a tubercle in the centre, but totally devoid of a spine or spines. The type, according to Mr. J. M. Clarke, is *O. ovata*, Emmrich, a form having some characters in common with our first species, but in others departing widely from it.

The specific history of the Acidaspidæ in Australia is a brief one. As recorded by Mr. F. Ratte,† Mr. Chas. Jenkins, L.S., appears to have been the first to recognise the presence of the genus in our rocks. He figured the greater portion of a Trilobite that he referred to *Acidaspis Brightii*, Murchison,‡ from Yass, but during our researches we cannot say that we have met with any Trilobite that would strictly agree with that species; indeed we have not seen a true *Acidaspis*, as now restricted, from Australia. Mr. Jenkins was followed by the late Mr. Felix Ratte, who contributed two papers to the Proceedings of this Society

* Brit. Org. Remains, Dec. vii., Pt. 6, p. 2.

† Proc. Linn. Soc. N.S. Wales, 1887, ii. (2), p. 99 (footnote).

‡ Proc. Linn. Soc. N.S. Wales, 1879, iii., Pl. 17, f. 5.

dealing with Acidaspids from Bowning. In the first he described species ascribed by him to the following well-known Trilobites* :—

A. Verneuli, Barr., or *A. vesiculosa*, Barr.

Acidaspis near *A. Prevosti*, Barr.

Acidaspis near *A. mira*, Barr.

In the second paper† the following :—

Acidaspis near *A. Dormitzeri*, Corda.

Acidaspis near *A. Leonhardi*, Barr.

At a later period one of us‡ described a new species, also from Bowning, as *A. longispinis*. The whole of these will be passed in review in the present paper.

We now recognise the following four species :—

Odontopleura bowningensis, nobis.

„ *Rattei*, nobis.

„ *parvissima*, nobis.

„ *Jenkinsi*, nobis.

ODONTOPLEURA BOWNINGENSIS, *sp. nov.*

(Pl. L., figs. 1-3; Pl. LII., fig. 5.)

Sp. Char.—*Body*—Ovoid. *Cephalic shield or cephalon*—Subelliptical, about three times as wide as long measured between the base of the genal spines, very tumid, rising abruptly from the posterior margin, which is unusually straight, ornamented with fine and moderately coarse granules. Glabella quadrate, central lobe small, oblong, very intensely arched transversely, moderately so fore and aft, and almost sloping into the front margin, granulated very distinctly, front lateral expansions distinct; lateral lobes small, granulated and tumid, median pair about half the size of the posterior pair and semiglobular, posterior pair suboval, each pair very distinctly separated from each other by the basal

* Proc. Linn. Soc. N.S. Wales, 1886, i. (2), Pt. 1, pp. 1066-69.

† *Loc. cit.* 1887, ii. (2), pp. 96-102.

‡ Mitchell. *loc. cit.*, 1888, iii. (2), p. 398; 1887, ii. (2), t. 16, f. 7-10, 12.

pair of glabella grooves; anterior pair absent; glabella grooves wide and distinct and joining the axial and false furrows; axial furrow faint anteriorly but distinct posteriorly; false furrows very distinct and wide. Fixed cheeks of moderate size; genal lobe subtriangular, very tumid, granulated; ocular bands or ridges very narrow and partly overhung by the genal lobes, and themselves intensely overhanging the free cheeks and bearing a distinct row of granules; genal or palpebral furrows distinct; eyelobes small, triangular areas very small. Free cheeks of tolerable proportionate size, intensely tumid, borders intensely thickened, particularly towards the genal angles, each bearing twelve short, acicular, deflected spines exclusive of the genal spines, marginal furrow very distinct. Genal spines short, stout, falcate, and forming obtuse angles with the cephalon. Facial sutures anteriorly appear to be soldered, but their course is indicated along and under the ocular ridges, and they incline towards each other at an angle of 35° , cutting the front margin in a line with the axial furrows; posteriorly they run obliquely to the median point of the lateral extensions of the fixed cheeks, thence parallel with those extensions to the genal angles. Occipital furrow wide and shallow centrally, but deep at the sides, continuing across the sides distinctly and joining the marginal furrows of the free cheeks. Neck or occipital ring strongly arched vertically, only moderately so backwards, sides nodular, no central tubercle. Eyes prominent, as high as the highest part of the central glabella lobe, small, very wide apart, the distance between them being equal to twice the length of the cephalon.

Thorax.—Consists of ten segments, width equal to the combined length of itself and pygidium, granulated. Axis prominent, rather wider than the pleuræ, posterior width half of the anterior width, rings nodular at the sides. Pleuræ flat between the axial grooves and the fulcra, thence short and sharply deflected, sutures distinct, median ridges prominent, tuberculated, one very prominent tubercle on each ridge nearer the fulcra than the axial grooves, forming a longitudinal row along each lateral lobe; ends of pleuræ or median ridges thickened and bispinate, posterior

spines long and acicular, anterior ones short and lanceolate and serrated, all much deflected. Axial furrows faint.

Pygidium.—Small, about four times as wide as long, strongly tubercular; the anterior margin straight between the fulcræ, thence gently turned backwards. Axis prominent, consisting of one highly arched anterior ring and a terminal piece which is ridged and circumfurrowed, and centrally depressed. The lateral lobes are divided into two pairs of pleuræ by one pair of pleural ridges, extending from the axis ring; they are flat, tuberculate and punctate, border much thicker and internally bounded by a distinct furrow. Tail spines fourteen, acicular, four intermediate and four on each side of the axial pleural spines, the latter diminishing rapidly in length from the axial pair outwards, so that the first and second pairs are very short.

Obs.—The striking features of this species are:—(1) The great proportionate width, particularly of the cephalon; (2) the deflected spines and short, jutting, obtuse hornlike genal spines; (3) the very small eyes; (4) the absence of an occipital tubercle; (5) the great width between the eyes and their nearness to the posterior margin of the cephalon; and (6) the excessive tumidity of the cephalon as a whole.

Whilst resembling *O. ovata*, Burmeister,* the generic type, in the great proportionate breadth of the body to its length, our form departs very markedly in possessing ten instead of eight thoracic segments, in the very small pygidium, the increased number of spines around the margin of the latter, and in the shorter and stouter genal spines. Similar characters separate it from *O. elliptica*, Burmeister.† From an allied American species, *O. crossota* (Locke), Meek,‡ our species is separated by the size, shape, and segmentation of the pygidium. In this species also the facial suture extends even further laterally than in *O. bowningensis*, and there is no occipital tubercle.

* Organization of Trilobites, 1846, p. 62, t. 2, f. 11.

† *Loc. cit.* p. 63, t. 1, f. 4.

‡ Ohio Geol. Report, 1873, I. t. 14, f. 10, 10a.

From the American Devonian species *O. callicera*, Hall,* our species is equally distinct. It lacks the long genal spines and large eyes of the former and possesses a greater number of cheek spines.

It is with the Bohemian species that the Bowning Trilobite seems to correspond best, although it is a broader form than the majority of the former, if not indeed of all those allied to it.

In *O. Leonhardi*, Barr., the pleuræ are single-spined, in our form double, and the pygidium spines are increased in number and are constant. In the former the genal spines are long and acicular, in the latter short and stout, and the courses of the facial sutures are different in the two species.

From *O. minuta*, Barr., *O. bowningensis* is at once distinguished by the uniformity of the spines extending from the pygidium of the former, and again by the nature of the pleural and genal spines. It may be said also that the same characters separate our form from *O. Dormitzeri*, Barr., and *O. Roemeri*, Barr. In the latter the backward extension of the genal spine is enormous.

The description is taken from decorticated specimens.

Loc. and Horizon—Bowning Creek, near Bowning, Co. Harden, Lower Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

ODONTOPLEURA RATTEI, *sp. nov.*

(Pl. L., fig. 7; Pl. LI., figs. 8-9; Pl. LII., figs. 1-4; Pl. LIII., figs. 1-3.)

Acidaspis near *A. Leonhardi*, Ratte (non Barr.), Proc. Linn. Soc. N.S. Wales, 1887, ii. Pt. 2, p. 99, Pl. 2, figs. 2-4.

Sp. Char.—*Body*—oval. *Cephalic shield or cephalon*—Subsemi-circular, a little wider than twice the length, and straight in front. Glabella quadrate, width between eye lobes equals length, including the neck ring, distinctly and evenly granulate, front margin dentate; central portion suboblong, intensely arched transversely, moderately so from front to back, highest medially

* Pal. N. York, 1888, vii. t. 16b, f. 1-13.

and bending rapidly to and merging into the front margin, slightly expanded in front; the first pair of lateral lobes in a rudimentary form (tubercles merely); lateral portions distinctly bilobed, median pair suboval, very tumid, about half the size of the posterior pair, and very distinctly separated by the glabella furrows which join the axial and false axial furrows; false axial furrows very distinct, particularly at their junctions with the lateral furrows, passing into the neck furrow; axial furrows distinct and intensely so as they join the neck furrow, faint across the posterior margins. Fixed cheeks suboblong, tumid; genal lobes ridged; ocular ridges or bands prominent, each bearing a row of granules; genal furrows distinct; triangular areas large and flat. Free cheeks very tumid, granulated, borders thickened, marginal furrows distinct and terminating at the front angles of the glabella, the borders bear fourteen acicular spines exclusive of the genal spines, which are also acicular, strong, slightly falcate and long, and bear the last two or three cheek spines; facial sutures anteriorly straight and nearly parallel with the axial centre, posteriorly parallel with the lateral extensions of the fixed cheeks. Neck furrow shallow generally, but deep at its junctions with the axial furrows, its lateral extensions interrupted by the tumid ends of the neck ring, thence moderately distinct across the posterior borders of fixed cheeks. Neck or occipital ring strong, intensely arched backwards, ends nodular, granulated, and central tubercle present. Eyes prominent, of medium size, conoid and faceted.

Thorax.—Consists of nine segments, suboblong or subfusiform, width equal to the combined length of itself and pygidium, exclusive of the spines; axis prominent, having two rows of distinct dorsal granules, rings arched backwards, ends nodular, width equal to width of side lobes between the fulcrum and axial furrows, which are faint; side lobes horizontal between axial furrows and fulcra, thence moderately deflected, median ridges of pleuræ strong and prominent, and each at the fulcrum bears a very distinct tubercle, forming a persistent row on each lobe, on the deflected ends the ridges widen, and are produced into long

acicular spines, except in the case of the first pair of pleuræ on each lobe, which are very rudimentary; the spines of the third pair equal the length of the thorax and tail together, and are flected backwards at about 45° , each succeeding pair increasing in backward flexion till those from the last pair are rectangular to the thorax.

Pygidium.—Widely triangular, rather flat, strongly granulated; front margin straight between the fulcræ, thence backwards at an angle of 45° nearly. Axis short, consisting of one very prominent ring and terminal piece, the latter clearly separated from the former by a furrow, and bearing a small but distinct and persistent granule on each side, and is also nearly circumfurrowed. From the ends of the axis ring extend a pair of pleural ridges obliquely and distinctly across the lateral lobes, and are produced into the axial or pleural spines. Side lobes divided into two lobes, one pair of pleural furrows present, border bearing twelve to fourteen acicular spines, two intermediate and four to five exterior to the axial pair; the first two on each side adjacent to the anterior face are rudimentary and seldom visible when the tail is attached to the thorax; the pleural pair have a length equal to half the length of the thorax; intermediate pair appear to be about two-thirds as long as the axial pair; all bear a row of granules.

Obs.—This species is one of those figured by the late Mr. Felix Ratte,* and placed by him near *O. Leonhardi*, Barr., although he was careful to point out that it did not strictly accord with that Trilobite.

From the preceding form, *O. bowringensis*, nobis, it may be at once distinguished by possessing a segment less in the thorax, by the presence of frontal spines or serrations to the glabella proper, and so far as we are able to discern, by the thoracic pleuræ being unispinate only; furthermore, it is a more slender species. The genal spines are very different, as are also the pygidium and other parts.

* Proc. Linn. Soc. N.S. Wales. 1887, ii. (2), Pt. 2, p. 99, Pl. ii. figs. 2-4.

As regards *O. Leonhardi*, with which Mr. Ratte compared this fossil provisionally, the two are unquestionably near one another. Mr. Ratte appeared to think that a greater breadth existed in the fixed cheeks of the Australian fossil; but we would rather rely on other characters of possible specific value. For instance, the spines of our form are much longer and stouter than those of *O. Leonhardi*, the anterior ones of ours, too, are always flected backwards at a greater angle; the genal spines at their bases press on the two anterior pairs of the thoracic pleuræ, and these two pairs of pleuræ have very rudimentary spines, which is a feature of itself that clearly separates it from *O. Leonhardi* and its congeners. The frontal margin of the glabella of *O. Rattei* is spined or serrated, but the margin of *O. Leonhardi* is smooth. The pleural spines are more graduated in length from before backwards, producing a remarkable frill-like appearance in *O. Rattei*, whilst the characters of the pygidium are very distinct. In *O. Leonhardi*, between the axial or pleural spines are four peripherals, and exterior to the former two peripheral spines on either side. In *O. Rattei*, on the other hand, there are in a typical specimen two peripheral spines occupying the first position and four to five the second; but in another typical specimen (immature) there are two peripherals in the first and three to four in the second position. We have never seen three spines on the pygidium of *O. Rattei* between the axial or pleural spines, and it is wider and the spines larger, longer and more unequal in length than is the case with those of *O. Leonhardi*.

The normal number of spines that can be seen on a pygidium of *O. Rattei* when attached to the thorax is ten, and the actual number twelve, the one on each angle being mostly very rudimentary, and in some specimens bifurcate. In cases such as the latter, a tail may bear fourteen spines, but not more than ten would probably be visible if the fossil were complete.

Odontopleura pigra, Barr., sp.,* is so far related to the present species that although the pleural spines of the first two thoracic

* Novak, Dames & Keyser's Pal. Abh. 1890, v., Heft 3, t. 2, f. 11 & 13.

segments are present, they are so much reduced in size as to indicate a transition towards *O. Rattei*.

Named in honour of the late Mr. Felix Ratte, Mineralogist to the Australian Museum, Sydney.

Loc. and Horizon.—Bowning Village, Co. Harden, Middle and Upper Trilobite Beds—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

ODONTOPLEURA PARVISSIMA, *sp. nov.*

(Pl. L., figs. 4-6; Pl. LII., fig. 8.)

Acidaspis near *A. Dormitzeri*, Ratte (non Corda), Proc. Linn. Soc. N.S. Wales, 1887, ii. (2), Pt. 2, p. 96, t. 2, f. 1, 1 bis.

Sp. Char.—*Body.*—Suboblong-oval. *Cephalic shield or cephalon.*—Subquadrate, twice as wide as long, tumid and strongly tubercled throughout. Glabella quadrate, half as long as the thorax, or including the neck ring its length equals the width between the eyes; central lobe narrow, intensely arched transversely, moderately so fore and aft, extending to the front or limb, which is straight and appears under a strong lens to be delicately dentate; the lateral lobes mere tubercles; lateral and false furrows distinct; axial furrows indistinct. Fixed cheeks very small and tumid; genal lobes very small (practically narrow bands each bearing a row of tubercles); genal or palpebral furrows moderately distinct; ocular ridges distinct anteriorly and tubercled. Eyes very small and prominent. Free cheeks proportionately large, tumid, outer borders thickened, narrow, and each bearing ten short acicular horizontal spines, and on the upper surface a row of prominent tubercles; genal angles produced into long, slender and subfalcate spines. Facial sutures distinct, anteriorly gently curving towards the axis and passing out at the front angles of the central lobe; posteriorly are parallel with the edges of the lateral extensions of the fixed cheeks, and pass out at the genal angles. Neck furrow distinct, narrow, lateral extensions faint. Neck ring intensely arched, lateral nodules small, but distinct, tubercled, but no prominent central tubercle.

Thorax.—Possesses nine segments, nearly square, greatest width equal to its length. Axis prominent, wider than the pleural lobes; rings faintly nodular at ends, dorsally each bearing two prominent tubercles. Axial furrows distinct. Lateral lobes narrow; pleural ridges and sutures very distinct, each pleural ridge bearing two very prominent tubercles, one at the fulcrum and the other near the axial furrow; at least seven pairs of pleuræ bear acicular spines, those on the third pair (none visible on the first and second pairs) are short, and at right angles with the axis, each succeeding pair have an increasing backward flexion till the last pair are parallel with the axis, they also increase in length posteriorly; the fifth, sixth and seventh pairs are subfalcate, the eighth and ninth pairs in some specimens show indications of having stood upright.

Pygidium.—Very small, widely triangular, distinctly tubercled. Axis very prominent, consists of one ring and small terminal piece; both bear a pair of small tubercles. Lateral lobes divided into two pleuræ by the pleural ridges extending from the ends of the axis ring; these ridges are bituberculate; the border bears eight acicular spines of nearly uniform length, four intermediate and one on each side of the principal pair. Axial furrows distinct.

Obs.—This species was briefly described by Mr. F. Ratte,* and determined by him to be near *O. Dormitzeri*, but he pointed out that it did not exactly agree with that or any other species known to him. He noticed the small proportionate length of the tail to the whole body, and the rounded contour of the free cheeks, and with these observations we agree. In his description he apparently fell into an error in assigning an ample genal lobe or triangular area, which we find to be very small, also in locating the eyes much more forward than they are in allied species. In this latter feature it agrees with the *O. Leonhardi* type in having the eyes near the posterior border of the cephalon. It is, however, separated from *O. Leonhardi* and its congeners by possessing no triangular areas on the glabella, in its more rounded and expanded

* Proc. Linn. Soc. N.S. Wales, 1887, ii. (2), Pt. 2, p. 96, t. 2, f. 1, 1 bis.

free cheeks, and in the structure of the pygidium, in which characters it also differs from *O. Rattei*, nobis. The tuberculation is singular among the known Australian species. It resembles *O. Rattei* in the proportionate length to width of the cephalon, and in the pleuræ being unispinate.

In form it approaches *O. minuta*, Barr., but as the late Mr. Ratte pointed out, it bears only two rows of tubercles on the pleural lobes, while on those of *O. minuta* there are three rows; and the largest of our specimens is not more than half the size of that fossil. The genal and pleural spines are much larger in ours than in the Bohemian species.

Mr. Ratte seems also to have erred in fixing the number of cheek spines at fourteen. We find them to be ten; and they occupy two-thirds of the border, the anterior third being spineless.

From *O. Dormitzeri* our species differs in having a much more quadrate cephalon, a highly granulose pygidium, and an absence of the axial pleural spines. It is much nearer to *O. minuta*, Barr., and this is in all probability its nearest ally. The distinguishing features of *O. parvissima* are—(1) The semicircular curve of the borders of the free cheeks; (2) the fine acicular cheek spines; (3) the subfalcate pleural spines; (4) the tubercled pleural ridges; (5) the uniform tail spines, and absence of strong pleural ridges (pads) on the pygidium; (6) the small central and lateral glabella lobes; (7) the remarkably strong tuberculation of the whole test; (8) its minuteness; and (9) the equality in the length of the thorax and width of the head-shield.

Our Pl. L., fig. 4, is drawn from the same specimen as Mr. Ratte's t. 2, f. 1, bis.

Loc. and Horizon.—Bowling Creek, Co. Harden, Lower Trilobite Bed—Bowling Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

ODONTOPLEURA JENKINSI, *sp.nov.*

(Pl. LII., figs. 6-7; Pl. LIII., figs. 4-7.)

Acidaspis Brightii, Jenkins (*non* Murch.), Proc. Linn. Soc. N.S. Wales, 1879, iii., p. 221, t. 17, f. 5.

Acidaspis Prevosti, Ratte (*non* Barr.), *loc. cit.* 1886, I. (2), Pt. 4, p. 1069, t. 15, f. 12 (excl. f. 11).

Sp. Char.—This species is so near *O. Rattei*, nobis, that it will be sufficient for us to state the points of difference between the two fossils on which we rely for justification in separating them. In *O. Jenkinsi* the limb or margin in front of the glabella is smooth instead of being dentated as in *O. Rattei*; each pleura of the thorax bears two prominent tubercles, and some of the anterior pairs four, the axis also appears more prominent. The pygidium carries the same number of spines as that of *O. Rattei*, but four of them are constantly intermediate of the principal or axial pair. The side lobes are more distinctly ridged and furrowed, the ridges are surmounted by very distinct rows of tubercles. The pleural ridges from the axial ring are less prominent than they are in *O. Rattei*, but the tuberculation is more conspicuous throughout.

Obs.—We hesitated very much about according this form specific separation from *O. Rattei*, and we do so only after examining a great number of specimens and finding that the characters already pointed out were constant, and because it comes from a higher horizon and is not found associated with *O. Rattei* in the lower horizon, where that fossil is very numerous.

We believe that this is the Acidaspid described and figured by Mr. Jenkins as *Acidaspis Brightii*, and as pointed out by Mr. Ratte, this appears to have been the first notice of the discovery of a member of this family in Australia. With regard to its identification with *O. (Acidaspis) Brightii*, Murch., we are quite in accord with the doubt expressed by Mr. Ratte, and also admitted by Mr. Jenkins himself. The points which separate *O. Rattei* from the European and other members of the genus known to us, given under its description, will also apply to this, except that it approaches still nearer to *O. Leonhardi* than does *O. Rattei* in having a smooth frontal glabella margin.

Loc. and Horizon.—Bowning Railway-Station Yard, Bowning Village, Co. Harden, Upper Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

Genus CERATOCEPHALA, Warder, 1838.

Ceratocephala, Warder, Am. Journ. Sci., 1838, xxxiv., p. 377.

Trapelocera, Corda, Prod. Böhm. Trilobiten, 1847, p. 158.

Trapelocera, Angelin, Pal. Scandinavia, 1878 (Lindström's edit.)
p. 34.

Ceratocephala, Clarke, 10th Ann. Rept. State Geol. N. York for
1890 (1891), p. 67.

Obs.—Mr. J. M. Clarke has already indicated the lines on which this name should be used, and it is here adopted by us in conformity with his researches, except that we employ it as one of the genera of the Odontopleuridæ rather than as the typical generic name of the whole group, superseding *Acidaspis*, for reasons already given.

In Australia *Ceratocephala* is represented by four species, so far as we have been able to ascertain, viz. :—

Ceratocephala Jackii, nobis.

„ *Vogdesi*, „

„ *impedita*, nobis.

„ *longispina*, Mitchell.

The last may possibly appertain to the genus *Selenopeltis*, Corda.

CERATOCEPHALA VOGDESI, *sp. nov.*

(Pl. L., figs. 8 and 9; Pl. LI., figs. 1-7; Pl. LIH., fig. 9.)

Acidaspis Verneuli, Ratte (*non* Barr.), or *A. vesiculosa*, Ratte (*non* Beyr.), Proc. Linn. Soc. N.S. Wales, 1886, i. (2), Pt. 4, p. 1066, t. 15, f. 5-10.

Acidaspis Prevosti, Ratte (*non* Barr.), *Loc. cit.*, p. 1068, t. 15, f. 11 (excl. f. 12).

Sp. Char.—Suboblong or oblong-ovoid. *Cephalic shield or cephalon*.—Suboblong, of complex structure, moderately tumid, rugose and tuberculate throughout, twice as wide as long, front margin rather straight and centrally slightly projecting; tubercles of various sizes, and some very conspicuous. *Glabella*:—Central lobe large, suboblong, front lateral expansions very distinct, only

moderately tumid and arched, sloping very gradually into the front marginal and neck furrows, frontal expansions triangular, very moderately tumid, and their apices reaching the anterior points of exit of the facial sutures; first pair of lateral lobes absent, median pair subconical or subtriangular, of moderate size, very moderately tumid, basal pair large, subquadrate, with rounded outer margins; first pair of glabella furrows deep and wide, second pair shallow towards the axial furrows and deep towards the false furrows, both pairs uniting the axial furrows with the false furrows; false furrows wide and deep; axial furrows very wide, distinct, shallow along the median portions. Fixed cheeks large; genal lobes large, ridged, tumid, subtriangular, united to the lateral lobes of the neck ring by the genal ridge, and falling abruptly into the lateral extensions of the neck furrow, bearing some very large tubercles. Genal or palpebral furrows moderately distinct and highly tubercled. Eye or palpebral lobes large, very prominent and triangular. Ocular ridge very prominent and overhanging the facial sutures. Eyes small proportionately, subpedunculate, fixed obliquely outwards and very slightly forward, remarkably near the front margin, very wide apart, the distance between them being equal to the diagonal from the base of a genal spine, and the point at which the facial suture cuts the front margin on the opposite side of the glabella, or one and a quarter times the length of the cephalon. Neck furrow wide and shallow behind the central glabella lobe, narrow and deep between the basal glabella lobes and the lateral lobes of the neck ring; its lateral extensions (as are the axial furrows also) are interrupted by the genal lobe ridges, and from the genal lobe ridges they extend widely and deeply to the bases of the genal spines, thence bend anteriorly, passing (deeply under the eyes) to the front marginal furrows. Neck ring very wide and very moderately arched vertically, but greatly so posteriorly. Occipital spines strong, long, and originating in the median transverse line of the neck ring, extending upward and outward for the first part at an angle of 60° , then arching backward and inward and the ends sharply deflected. Facial sutures soldered, but indicated anteriorly along

and under the ocular ridges, passing out in a line with the outer edges of the median glabella lobes, and cutting the margins at an angle of about 25° . Free cheeks subtriangular or subcrescentic, much expanded at the front lateral angles, from thence to the genal angles rather straight and inclining inwards, highly tuberculate and rugose; genal spine ridges strong, very prominent, and vanishing under the eyes; borders distinct, strap-like, smooth and entire; marginal furrows faint; genal angles almost in a line with eyes, axially, bearing strong, suberect, long arching spines, which will apparently reach to the fifth or sixth thoracic segment.

Thorax.—Unknown in a complete state, probably consisting of ten segments, and as wide as long; very conspicuously tuberculated and granulated, and flat. Axis very distinct, very moderately arched vertically, ends of segments very distinctly separated from the central portion by furrows, strongly inclined forwards, and with a very joint-like character, only moderately tumid; central portion of segments without backward arch, each segment bearing two prominent tubercles, one on either side, about midway between the nodes and the central line; articulating surfaces very large, furrows distinct. Lateral lobes horizontal; ventral ridges of the pleuræ on the inner halves as wide as the pleuræ, thence contracting to the bases of the pleural spines and leaving low grooved triangular areas on each side, of which the anterior ones are the largest, they are furrowed along the central line from the bases of the spines for about half of their length; the interpleural furrows very deep and wide; sutures distinct, straight and rectangular to the axis. Pleuræ bispinate, principal or upper spines very long, barbed, and on the anterior pleuræ subhorizontal, and subrectangular to the axis, subarcuate with reflected ends, posterior ones having sharply backward and upward directions; posterior pair at least rising perpendicularly from the pleuræ with their extremities converging towards each other, and originating some distance short of the extremities of the pleuræ; the secondary or inferior spines originate almost immediately under the principal spines, are stout, cylindrical, flected sharply downwards and forwards at about 30° and barbed with acicular

spines; each pleura bears a number of large tubercles, usually four, along the front margin of the ridge and two or three on the posterior margin, two of them very persistent, one on the anterior angle adjoining the axial furrows, and one on the posterior margin a short distance from the axial furrow; these large tubercles (as is the whole surface of the pleuræ) are covered with smaller tubercles; the tubercles from which the spines arise in the posterior pair of pleuræ are very large. Axial furrow very distinct.

Pygidium.—Proportionately very small and granulate, at least four times wider than long, arciform. Axis consists of one rather intensely arched ring; axial furrows distinct and deeply curving inwards behind the axial ring; side lobes slender, border indistinct, lateral angles acicular and having a slight forward curve; spines are seven in number, very strong, cylindrical, long, sub-uniform, and strongly barbed and granulated, central one projecting from the axial ring.

Obs.—On the nodes of the axis the granules sometimes become confluent and form ridges parallel to the longer axis, and the posterior pleural spines when decorticated are fluted longitudinally.

The late Mr. Ratte was right in regarding this species as closely allied to *C. Verneuli* and *C. vesiculosa*, Barr., but after careful comparison of ours with the figures of those species given by Barrande we find it possesses so many features peculiar to itself that, in our opinion, give it indisputable claim to rank as an independent species.

From *C. Verneuli* it differs (1) by the absence of the spines along the anterior border of the cephalon and free cheeks; (2) in the relative position of the genal spines and their much greater extent and curvature; (3) by the barbed character of both of the pleural spines, the much greater size of these spines, and the vertical nature of the last pair of principal pleural spines; (4) by the contour of the cephalon, which in *C. Verneuli* has sharp re-entering angles from the free cheeks, while in *C. Vogdesi* the front margin is rather straight, projecting centrally, with greater backward curvature at the front angles of the free cheeks.

In *C. Verneuli*, however, the pleuræ are flattened from above quite similar to our figures of *C. Voydesi*.

The same features separate it from *C. vesiculosa*.

Mr. Ratte referred to the disputed point of the existence of an articulation between the pleuræ and the axial segments, said to exist in some trilobites by Emmrich, and disputed by Burmeister, the latter being upheld by Barrande. Mr. Ratte basing his opinions upon certain features one of our figured specimens exhibits, was inclined to support Emmrich's view. He says:— "One cannot help being struck in examining the specimen in question at the great resemblance to an articulation of the junction of the axis with the pleuræ. It seems as if the test (or its different joints) had been covered by a thin epiderm as admitted by Burmeister,* and that this epiderm is wrinkled at the articulation as shown in fig. 5, and especially in the enlarged sketch fig. 8."†

Whilst admitting the very joint-like appearance, somewhat exaggerated in Ratte's figure, we do not see any direct evidence of the jointing; but, on the contrary, there is one strong feature we have observed which disposes of the question in favour of the negative, and, that is, in all the many thoracic segments which have come under our notice, we have never seen a specimen divided at this point.

This joint-like appearance at the ends of the thoracic axial segments is also seen in the type of *Selenopeltis* (*S. Buchi*, Barr., sp.)

Ratte figured the principal tubercles of the pleuræ surrounded by a complete circlet of granules in every respect resembling the primary tubercle and its miliary ring on the interambulacral plates of an ordinary Echinid, such as the genus *Cidaris*. His figures correctly represent the specimen used by him, but on no other specimen can we find this feature nearly so distinct.

* Barrande, loc. cit. p. 231.

† Proc. Linn. Soc. N.S. Wales, I. (2), p. 1068, t. 15.

This is the largest Odontopleurid yet discovered, and seems to agree in size with *C. Verneuli*, its European analogue. When mature it appears to have been from four to five inches long.

We have had the advantage of studying the specimens provisionally referred by Mr. Ratte* to *Acidaspis Prerosti*, Barr. One of these (his fig. 11) we believe to be the present species, although Mr. Ratte represented spines along the frontal borders of the cephalon which do not exist in the specimen, whilst he neglected to figure the genal and occipital spines that are preserved. This specimen also shows the subpedunculate protruding character of the eyes.

Named in honour of our valued correspondent, Capt. Anthony W. Vogdes, U.S. Artillery, San Francisco, author of the highly useful "Bibliography of the Palaeozoic Crustacea."

Loc. and Horizon.—Bowling Creek, Bowling, and Limestone Creek, near Bowling, Co. Harden, Lower Trilobite Bed—Bowling Series (= *Hume Beds*, Jenkins, and *Yuss Beds*, David)—?Wenlock. *Coll.*—Mitchell; Australian Museum, Sydney; Geological Survey of N.S. Wales, Sydney.

CERATOCEPHALA JACKII, *sp. nov.*

(Pl. LIII., fig. 8, Pl. L. fig. 6.)

Sp. Char.—*Cephalic shield or cephalon*—Greatest width a little more than twice the length (16·7), subelliptical, very moderately tumid, and distinctly granulated. Glabella large, length from centre of the neck furrow equals the greatest width between the axial furrows; central lobe moderately tumid, and arched very gradually, sloping to the front margin and into the neck furrow, front angles slightly expanded; median and basal pairs of glabella lobes distinct, moderately tumid; glabella furrows wide and shallow; false furrows and also the axial furrows wide and shallow, the latter being much less distinct than the former. Fixed cheeks moderately large; genal lobes large, cleaver-shaped, granulated,

* Proc. Linn. Soc. N.S. Wales, 1886, I. (2), Pt. 4, t. 15, f. 11 and 12.

moderately tumid; ocular ridges filamentous, and distinctly tubercled; genal or palpebral furrows distinct, particularly anteriorly; palpebral lobe very small. Eyes very small, distance between them is to length of the cephalon as 10-7, or a little greater than the distance between a genal spine and the alternate neck spine. Free cheeks of moderate size, moderately tumid, laterally expanded beyond the genal angles, suboval; borders wide, tumid, each bearing a row of four distinct tubercles on the median line, and at least sixteen stout, horizontal spines, all having a forward direction and apparently increasing in length from front to back to the twelfth, from which each succeeding one is a little shorter; marginal furrow wide and distinct between the facial sutures and genal angles, where they terminate. Genal spines straight, acicular, sublender, and forming an angle of 100° with the posterior border of the cephalon, or of 120° with the straight line joining their bases, apparently of moderate length. Facial sutures anteriorly nearly straight, inclining inwards at an angle of 45° and passing out in front of the axial furrows, dividing the greatest width of the cephalon into three equal parts nearly, posteriorly arciform, passing out at the genal angles. Neck furrow wide and shallow, centrally deeper between the false and axial furrows, lateral extensions interrupted by the genal lobe ridges, distinct between the genal lobe and the genal spine ridges. Neck ring indistinctly separated from the neck furrow, very moderately arched, curved sharply backward, side lobes small. Occipital spines sublender, projecting backward, and but slightly raised and curved.

Thorax.—Unknown in a complete state. Pleuræ horizontal, flat, fulera very indistinct, ends not deflected nor thickened, bispinate; posterior spines strong, and projecting from the posterior angles of the pleuræ; anterior ones swimmeret-like or dagger-shaped, intensely barbed, directed forward and originating in the front angles of the pleuræ, so that the two spines on each of the posterior pleuræ at least have their points widely divergent from each other.

Pygidium.—Unknown.

Obs.—The glabella of this species is very similar to that of *C. longispina*, Mitchell (*Acidaspis longispinis*, Mitchell), but here the specific resemblance of the two species ceases. The cephalon of *C. Jackii* has a greater proportionate width, and its spined free cheeks, shorter and slender occipital, genal and pleural spines, and the very different anterior pleural spines clearly separate it from the former.

From *C. Vogdesi* it is so different that comparison is needless. For the same reason we need not enter into any explanation to differentiate it from *C. Verneuli* and *C. vesiculosa*, Barr. From *C. Dufrenoyi* it is distinguished by the much less quadrate outline of the cephalon in that species, nor does this species possess the expanded anterior lateral portions (free cheeks) of *C. Jackii*. The same feature also distinguishes it from *C. mira*, Barr., and in addition also the highly pedunculated eye of the last named is a strongly differentiating character. On the other hand like *C. Jackii*, Barrande's species possesses the peculiar swimmeret-like spines on the thoracic pleuræ. Lastly, in *C. Prevosti* these spines are replaced by short simple ones, whilst the proportions of the cephalon entirely disagree with those of *C. Jackii*.

Named in honour of Mr. R. L. Jack, Government Geologist of Queensland, who collected the specimens.

Loc. and Horizon.—Bathurst Road, near Bowning, Co. Harden, Middle Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—?Wenlock. *Coll.*—Geological Survey of Queensland, Brisbane; and Mitchell.

CERATOCEPHALA IMPEDITA, *sp. nov.*

(Pl. LIII., figs. 11-13.)

Sp. Char.—*Body and cephalon* in a complete form unknown. Glabella highly tumid, tuberculated throughout; central lobe very intensely arched transversely and longitudinally, long, narrow, much higher than the cheeks or lateral glabella lobes, much compressed laterally just behind the frontal expansions, which are very distinct, narrow and each surmounted by two distinct tubercles. Median and basal pairs of lateral glabella lobes only

present, long, narrow, very tumid, and granulated, subequal in length and not fully separated from each other by the basal glabella furrows on the outer sides; false furrows very deep and wide; median glabella furrows very deep, basal pair shallow, wide and not quite passing into the axial furrows; axial furrows distinct and narrow, and passing rather clearly over the genal lobe ridges. Fixed cheeks of moderate size; genal lobes very tumid, falling abruptly into the furrows of the lateral extensions and sloping more gradually anteriorly: ocular ridges indistinct, very filamentous; palpebral furrows distinct anteriorly; triangular areas small, lateral extensions short. Neck furrow wide, trough-like, very deep between the false and axial furrows, faint over the genal lobe ridges, thence narrow but distinct. Neck ring robust, thick, very distinctly arched; side lobes or nodules very small, and ridged. Occipital spines acicular and only moderately robust, arcuate.

Obs.—Thorax, pygidium, and free cheeks are unknown. It approaches nearer to *C. Jackii* than any other known Australian species, and from this it is readily separable by the much greater tumidity of the cephalon and its distinctive granulation; the longer central glabella lobe and its greater convexity; the longer, narrower, and more tumid lateral glabella lobes; the shorter lateral extensions of the fixed cheeks; by the more ridge-like prominent frontal glabella expansions and its prominent tubercle; and lastly by the very small lateral lobes of the occipital ring. The proportionate width between the eyes and length of the glabella is also different in the two species. From *C. longispina* it is separated by the same characters.

Loc. and Horizon.—Bowning Village, Co. Harden, Middle Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

CERATOCEPHALA LONGISPINA, *Mitchell, sp.*

(Pl. LIII., fig. 10; Pl. LIV., figs. 1-5.)

Acidaspis near *A. mira*, Ratte (*non* Barr.), Proc. Linn. Soc. N.S. Wales, i. (2), Pt. iv. p. 1069, t. 15, f. 13, 14. —

Acidaspis longispinis, Mitchell, Proc. Linn. Soc. N.S. Wales, 1888, iii. (2), Pt. 2, p. 398, t. 16, figs. 7-12.

Sp. Char.—*Body* oval, suboblong. *Cephalic shield or cephalon* only moderately tumid, and distinctly but sparsely granulated. Glabella with the central lobe suboblong, very moderately arched, and sloping gradually into the neck furrow and to the front margin, front angles moderately expanded and bearing distinct tubercles; three pairs of side lobes present, first very small, depressed, second and basal pair large, subcircular, moderately tumid and nearly of equal size; false furrows distinct and very wide; glabella furrows—first pair faint, second pair deep and distinct, uniting the axial and false furrows, basal pair very wide and shallow, also uniting the axial and false furrows; axial furrows very faint anteriorly and moderately distinct posteriorly; genal lobes small, distinctly and regularly granulated, prominent posteriorly, inconspicuous anteriorly; palpebral furrows distinct anteriorly; ocular ridges prominent, filamentous, and distinctly granulated; lateral extensions of the fixed cheeks robust, having very prominently thickened borders. Facial sutures anteriorly straight, and making angles of 120° degrees with the front margin, posteriorly straight, passing out at the genal angles, and making angles of 35° with the posterior borders of the cephalon. Eyes prominent, conoid, numerous and minutely faceted. Free cheeks of moderate size, borders very wide, moderately tumid, lobe-like, bearing several rows of granules, one of which is rather distinct, margins very minutely spinate, spines only visible under a lens, genal spines very long, strong, arcuate, and diverging from the thorax; triangular area small. Neck furrow very wide and shallow centrally, but deep behind the basal glabella lobes, very faint over the genal lobe ridges, thence distinct to the genal angles, branches distinct. Neck ring very moderately arched, wide, surmounted centrally by a very prominent granule; nodules or side lobes distinct, separated from central portion by the axial extensions of the neck furrow; occipital spines very robust and long, arching, the ends divergent and apparently reaching to the extremity of the pygidium.

Thorax.—Apparently consists of nine segments, length equal to the width, sparsely granulated; axis prominent and as wide as the side lobes, nodules inconspicuous; axial furrows moderately distinct; lateral lobes horizontal, pleural ridges moderately conspicuous, the anterior pleural margins raised into ridges, and giving to the pleuræ the appearance of being centrally furrowed instead of being ridged; pleural spines on the first, second and third pairs of pleuræ moderately reflected and much smaller than those situated more posteriorly; the latter are very long, hastate, robust and intensely flected backwards, centrally fluted when compressed; secondary or anterior spines small, paddle-shaped, subfalcate, having entire margins, and the appearance of articulation to the pleuræ.

Pygidium.—Triangular, two and a half to three times as wide as long, granulated distinctly; axis very prominent, one-half to two-thirds of the length of the pygidium, unsegmented, bearing one prominent ring; axial furrows faint; side lobes flat, undivided, one pair of pleural ridges present, extending from the ends of the axial ring, borders inconspicuous; pleural spines strong, acicular, converging, and about as long as half the pygidial width, but except for these the border is practically entire, although under a lens very minute spination or serration is visible along the whole margin.

Obs.—Mr. Ratte figured (*loc. cit.*) two imperfect glabellaæ of this species and referred them to *A. mira*, Barr., but as will be readily seen by a comparison of the descriptions and figures of the two fossils they are widely dissimilar. This species was afterwards characterised, fully described and figured by one of us.

C. longispina is so clearly distinct from all the other Australian species of the genus that it is unnecessary to point out the divergencies. Its chief characteristics are: the practically spineless cheek borders; presence of three pairs of lateral glabella lobes; the very large occipital spines which are borne by a cowl-like appendage originating at the back of the central glabella lobe, instead of originating in the occipital ring; the massive principal

pleural spines and non-serrated secondary spines; the simple bispinate pygidium; prominent and clearly faceted eyes.

Many cephalons occur from which the cowl and spines have separated, and left the occipital ring quite smooth and to all appearance spineless.

C. longispina attains a length of two and two-thirds inches. The pygidium bears a very close resemblance to that of *Selenopeltis Buchii*, Barr., sp., in its spineless margin other than the axial spines.

The cephalon represented in Pl. LIV., fig. 2, possesses occipital spines that exhibit a decided tendency to curl underwards, as do those of *Selenopeltis Buchii*, Barr. More complete examples of our form may determine the necessity of transferring it to Corda's genus.

Loc. and Horizon.—Bowling Village, Co. Harden, Middle and Upper Trilobite Beds—Bowling Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David). *Coll.*—Mitchell.

EXPLANATION OF PLATES.

Plate L.

ODONTOPLEURA BOWNINGENSIS, *E. and M.*

Fig. 1.—A nearly complete specimen, but with the genal spines wanting, and the various portions of the cephalon undisturbed ($\times 2\frac{1}{2}$). *Coll. Mitchell.*

Fig. 2.—A cephalon with one genal spine preserved ($\times 3\frac{1}{2}$). *Coll. Mitchell.*

Fig. 3.—A cephalon somewhat distorted. *Coll. Mitchell.*

ODONTOPLEURA PARVISSIMA, *E. and M.*

Fig. 4.—A nearly complete example ($\times 3$). *Coll. Mitchell.*

Fig. 5.—Portion of a thorax, and the pygidium ($\times 4$). *Coll. Mitchell.*

Fig. 6.—Portion of a cephalon ($\times 2\frac{1}{2}$). *Coll. Mitchell.*

ODONTOPLEURA RATTEL, *E. and M.*

Fig. 7.—An almost complete example, with the central lobe of the glabella removed, exhibiting the labrum in position ($\times 3$). *Coll. Mitchell.*

CERATOCEPHALA VOGDESI, *E. and M.*

Fig. 8.—Portion of a cephalon, with the right genal spine preserved and the right occipital spine indicated ($\times 2$). *Coll. Mitchell.*

Fig. 9.—Bispinate distal end of a thoracic pleura, the spines barbed; slightly enlarged. *Coll. Mitchell.*

Plate LI.

CERATOCEPHALA VOGDESI, *E. and M.*

Fig. 1.—Portion of a thorax showing the peculiar distal termination of the axial segments, tubercles of the pleuræ, and large and strong spines of the latter; somewhat reduced. *Coll. Australian Museum, Sydney.*

Fig. 2.—Portion of another thorax exhibiting the bispinate character of the distal ends of the pleuræ; somewhat reduced. *Coll. Mitchell.*

Fig. 3.—Cephalon showing the nature of the genal and occipital spines and position of the eyes; slightly reduced. *Coll. Mitchell.*

Fig. 4.—The last thoracic segment with its perpendicular spines; slightly reduced. *Coll. Mitchell.*

Fig. 5.—Pygidium with its barbed spines; slightly reduced. *Coll. Mitchell.*

Fig. 6.—A principal tubercle from one of the pleuræ of fig. 1; highly magnified.

Fig. 7.—A principal tubercle from a similar position on fig. 2; highly magnified.

ODONTOPLEURA RATTEI, *E. and M.*

Fig. 8.—Glabella without the side lobes, showing granulation and occipital tubercle; slightly enlarged. *Coll. Mitchell.*

Fig. 9.—Free cheeks; somewhat enlarged. *Coll. Mitchell.*

Plate LII.

ODONTOPLEURA RATTEI, *E. and M.*

Fig. 1.—A nearly complete specimen ($\times 2\frac{1}{2}$). *Coll. Mitchell.*

Fig. 2.—A cephalon without the free cheeks, &c. ($\times 2\frac{1}{2}$). *Coll. Mitchell.*

Fig. 3.—The pygidium with strongly developed spines ($\times 3$). *Coll. Mitchell.*

Fig. 4.—Portion of the two posterior thoracic segments, and the pygidium ($\times 2\frac{1}{2}$). *Coll. Mitchell.*

ODONTOPLEURA BOWNINGENSIS, *E. and M.*

Fig. 5.—The four posterior thoracic segments and the pygidium ($\times 2\frac{1}{2}$). *Coll. Mitchell.*

ODONTOPLEURA JENKINSI, *E. and M.*

Fig. 6.—Portion of the thorax and pygidium showing very distinctly granulation on the pleural ridges; slightly enlarged. *Coll. Mitchell.*

Fig. 7.—Pygidium only, showing pleural ridges and their granulation; slightly enlarged. *Coll. Mitchell.*

ODONTOPLEURA PARVISSIMA, *E. and M.*

Fig. 8.—Free cheek with genal and marginal spines, and eye ($\times 3$). *Coll. Mitchell.*

Plate LIII.

ODONTOPLEURA RATEI, *E. and M.*

Fig. 1.—Cast from an impression of an almost perfect individual; spines of pygidium incorrectly shown; somewhat enlarged. *Coll. Mitchell.*

Fig. 2.—Thorax and pygidium, the two anterior segments of the former devoid of pleural spines; somewhat enlarged. *Coll. Geol. Surrey Queensland, Brisbane.*

Fig. 3.—Free cheek; slightly enlarged. *Coll. Mitchell.*

ODONTOPLEURA JENKINSI, *E. and M.*

Fig. 4.—An almost complete example, with a single series of tubercles on either side; somewhat enlarged. *Coll. Mitchell.*

Fig. 5.—Three thoracic segments with from two to three rows in a similar position; somewhat enlarged. *Coll. Mitchell.*

Fig. 6.—Glabella with its lateral lobes and extensions of the neck ring and one free cheek; slightly enlarged. *Coll. Mitchell.*

Fig. 7.—A second glabella; slightly enlarged. *Coll. Mitchell.*

CERATOCEPHALA JACKII, *E. and M.*

Fig. 8.—Impression of the cephalon; slightly enlarged. *Coll. Geol. Surrey Queensland, Brisbane.*

CERATOCEPHALA VOGDESI, *E. and M.*

Fig. 9.—Pygidium with its large dentate spines; somewhat enlarged. *Coll. Mitchell.*

CERATOCEPHALA LONGISPINA, *Mitchell, sp.*

Fig. 10.—Pygidium with its axial spines; somewhat enlarged. *Coll. Mitchell.*

CERATOCEPHALA IMPEDITA, *E. and M.*

Fig. 11.—Portion of the cephalon, showing glabella, side lobes and bases of occipital spines; slightly enlarged. *Coll. Mitchell.*

Fig. 12.—Another and less perfect specimen; slightly enlarged. *Coll. Mitchell.*

Fig. 13.—A third example; slightly enlarged. *Coll. Mitchell.*

Plate LIV.

CERATOCEPHALA LONGISPINA, *Mitchell, sp.*

Fig. 1.—Portion of the cephalon and thorax; slightly reduced. *Coll. Mitchell.*

Fig. 2.—Cephalon less the free cheeks, with the occipital spines *in situ*, the left one showing a tendency to curl under as in the genus *Selenopeltis*; somewhat enlarged. *Coll. Mitchell.*

Fig. 3.—A similar specimen; somewhat enlarged. *Coll. Mitchell.*

Fig. 4.—Free cheek, with the eye *in situ*; somewhat enlarged. *Coll. Mitchell.*

Fig. 5.—Distal end of one of the posterior thoracic pleurae with its enormously elongated spine; somewhat enlarged. *Coll. Mitchell.*

Fig. 6.—Crushed cephalon and thorax, with the position of the occipital spines indicated; somewhat enlarged. *Coll. Geol. Survey Queensland, Brisbane.*

Plate LV.

Structural diagrams of the cephalon of *Odontopleura* and of *Ceratocephala*.

Fig. 1.—*Odontopleura*.

Fig. 2.—*Ceratocephala*.

Reference Letters.

aa. Central lobe of the glabella. *bb.* Anterior lateral lobes of the glabella (seldom present). *cc.* Median lateral lobes of the glabella. *dd.* Basal or third pair of lateral glabella lobes. *ee.* Lateral lobes of the neck ring. *ff.* Genal or cheek lobes (in *Odontopleura* mostly very rudimentary). *gg.* Genal spines. *hh.* Neck furrow. *iii.* False furrows. *jj.* Front lateral expansions of the central lobe of the glabella. *kk.* Lateral cheek furrows. *mm.* Cheek borders with spines. *no.* Ocular ridge. *on.* Posterior extension of ocular ridge present in some *Ceratocephala*. *oo.* Eyes. *p.* Palpebral lobes, very small in *Odontopleura*. *q.* Genal spine ridges. *r.* Neck ring. *zz.* Occipital spines. *tt.* Palpebral furrow. *xxxxx.* Axial furrows. *yy.* Lateral extensions of the neck furrow. *ww.* Genal lobe ridges, joining the genal lobes to the lateral lobes of the neck rings and interrupting the lateral extensions of the neck furrow. *fs.fs.* Front border of the glabella, sometimes bearing fine spines. *fs.o.fs.* Facial sutures, sometimes not defined or soldered as in the case of *C. Voydesi*, nobis. *ix.ix.ix.ix.* Lateral glabella furrows, seldom more than two pairs present. *tri.* Triangular areas, very small or absent from *Ceratocephala*. *hv.* Branches of the neck furrow or continuations of the false furrows. *tu.* Central tubercle of the neck ring. *fs.z.* Thickened borders or ridges of lateral extensions of the fixed cheeks.